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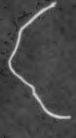

BULLETIN OF
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THE SURGICAL TREATMENT OF CHRONIC DUODENAL ULCER*

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THE value of surgery as the procedure of choice in the treatment of chronic duodenal ulcer is dependent upon the results of previous medical management. Analysis has shown that surgical failures are often due to inadequate preoperative medical care, or occur when surgery is used as a short cut to restoring the patient's earning capacity. In the latter instance it has been found that this is best accomplished by medical care.

Our observations in the Stomach Clinic of the Fourth Division of Bellevue Hospital over the past 18 years have shown that chronic duodenal ulcer can be treated most satisfactorily on a medical regimen. Of 1256 stomach ulcers reviewed in 1942,[1] 89 per cent were duodenal. Over a fourteen year period we had 993 unoperated cases and in only 14 per cent of these was operation advised. During 1942 and 1943, eighty-five operations were reported[2] of which nineteen, or 22 per cent, had been surgical failures from a previous operation. On the basis of these observations it seems apparent that through an appreciation of the

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value of prolonged medical treatment, a high percentage of surgical failures can be avoided.

Indications for Surgery

The indications for surgery frequently discussed in the literature are pyloric stenosis, recurrent hemorrhage, penetrating ulcers, lack of coöperation on the part of the patient under medical management, and intractable pain. In my opinion the last mentioned condition is the one real indication for surgical intervention.

The stenosing and obstructing ulcer has recently been reviewed by Allen[3] who feels that the stenosing lesion finally becomes a mechanical problem and the patient seeks help because he can no longer absorb nourishment to maintain life. The onset of such a condition is gradual and the end-stage is reached so insidiously that frequently the stomach is found to be enormously dilated. It is remarkable that such an organ, emptying infinitesimal amounts of its contents into the duodenum causes so little distress. In the two clinics with which I am associated, it has been our experience that a patient with a stenosing or obstructing ulcer can be relieved by medical management, unless he is suffering severe pain. In the past thirteen years no patient with so-called pyloric obstruction unaccompanied by severe pain has been referred for surgical intervention. Many have been advised against operation.

Wilkinson[4] emphasizes that an obstruction of not more than three months' duration will respond satisfactorily to medical management but if an obstruction has been present for more than three months, recurrences are almost certain and operation is usually indicated. He does not mention pain as a factor in causing the obstruction. In our experience, obstruction without pain is due to edema and pylorospasm and not to scar tissue around the pylorus.

Massive hemorrhage, occurring once or oftener as an indication for surgery is a controversial question. It is difficult to differentiate between massive and moderate hemorrhage, and a study of the literature reveals a marked elasticity in the grouping of these cases. However, if we agree that a red blood cell count of 2,000,000 or less, a hemoglobin reading of less than 40 per cent, and lowered blood pressure with a moderate degree of shock, constitute massive hemorrhage, we can discuss the severe hemorrhages with better understanding.

Surgical management of massive hemorrhage may be considered un-

der two headings: surgical intervention in the stage of acute hemorrhage, which is occasionally indicated, and second, surgery as an elective procedure to prevent further hemorrhage. My views regarding the first mentioned type of management have been expressed in a previous publication.[5] The indications for surgery as an elective procedure are interpreted differently in different hospitals. The point emphasized by Allen[3] as to the dangers of massive hemorrhage in the different age groups has been fairly universally accepted. That is, in a patient over forty-five years of age, the prognosis is serious, while in a patient under forty-five, massive hemorrhage rarely proves fatal. Blackford and Allen[6] in a report of 151 fatal hemorrhages, record that in only thirty-five cases, or 23 per cent, was there a history of previous hemorrhage, in other words, 77 per cent of the fatalities occurred following the first hemorrhage—an interesting observation. These authors also observed that 34, or 23 per cent of the deaths, occurred at home, that is, about one in four patients died without reaching a hospital.

The management of the patient who has had a massive hemorrhage or even two and occasionally three massive hemorrhages will depend not so much upon the fact that he has had one or even three massive hemorrhages as upon the x-ray findings and his clinical history. From my experience, the patient with a massive hemorrhage who is not suffering pain of the chronic intractable ulcer seldom, if ever, requires operative intervention as an elective procedure.

If the patient is suffering severe pain associated with massive hemorrhage, then the indications are present for operative intervention. The hemorrhage is merely another indication that the ulcer has progressed to such an extent that the patient will obtain no further benefit from conservative measures and continued medical treatment may endanger his life from a sudden hemorrhage due to an erosion through the superior pancreaticoduodenal artery.

The penetrating or perforating duodenal ulcer, as diagnosed roentgenologically, does not necessarily constitute a true indication for surgical intervention. Here again, we must rely on the clinical evaluation of the symptomatology. If the patient has had an ulcer for years, with intractable pain, then the indications are obvious, but if he has had an ulcer for only a short period of time, and it proves to be a penetrating ulcer, medical management will very frequently relieve the symptoms and the niche will disappear.

Patients who will not coöperate under medical management should not be operated upon. If the surgeon accepts this type of patient for operation the results from surgical procedure will be unsatisfactory.

Operative Procedures

Before evaluating the different operative procedures for chronic duodenal ulcer, let us consider the physiologic principles involved. The etiology of ulcer is unknown but it is admitted that excessive secretion of acid is an important factor in its aggravation and possibly its production. We must realize that excessive acid is only one phase of the physiology of the stomach. Wolf and Wolff[7] have graphically illustrated the phases of gastric physiology in their clinical observation of a patient on whom a gastrectomy was done for a stricture of the esophagus. Their careful observation brings out three clearly correlated factors: hyperemia, hypersecretion, and hypermotility. When one of these is increased or decreased, all are affected. These authors showed that excitement or anger will cause an increase in secretion and motor activity, and redness of the gastric mucosa. Depressing states will contrariwise depress all of these functions, but they are never entirely eliminated. There is always a moderate degree of secretion, motor activity and hyperemia in the resting stomach. With excessive secretion of hydrochloric acid there is likewise an excess of pepsin and mucus, or the alkaline component of the stomach. The mucus neutralizes the acid, and when 20 cc. of 0.1 normal hydrochloric acid was given it did not increase gastric acidity, but caused an increase in mucous secretion. They found that 20 cc. of .34 normal hydrochloric acid had an even more pronounced effect on mucous secretion.

The emotional state of the individual has a marked effect on the gastric function. Mental depression is accompanied by depression of the gastric function. On the contrary, mental tension is accompanied by an increase in gastric function. These observations are important when we speak of treating duodenal ulcers by operative procedures based on physiologic principles.

The choice of gastroenterostomy as an operative procedure is based on the belief that gastric acidity is reduced by the influx of jejunal contents and the ulcer has a chance to heal. Lannin[8] believes that the alleged benefits from a gastrojejunostomy are due not only to the new avenue of escape for the stomach contents but also to the regurgitation

of the alkaline duodenal juices into the stomach with neutralization of the gastric secretion. Although in my experience the gastric acidity was usually lower following a gastrojejunostomy, none of the patients with duodenal ulcer studied was persistently achlorhydric, and the incidence of jejunal ulcer was 10 per cent.

Balfour[9] states that in his opinion it is not always advisable to remove a lesion situated on the posterior wall of the duodenum if the removal of such a lesion introduces considerable operative risk, and it should be kept in mind that an indirect procedure will bring about healing of the ulcer. He believes that it is a principle in gastric surgery that any operation which has ever been designed for treatment of peptic ulcer, whether it is a partial gastrectomy or a gastrojejunostromy, is based on physiologic principles.

Heuer and Holman[10] studied the gastric acidity by the histamine method in a follow-up of seventy-five patients following gastroenterostomy. They found that in fifty-six, or 75 per cent of the cases studied the end results were satisfactory after a period of from six months to ten years. In sixty-nine, or 92 per cent, free hydrochloric acid was found to be present in normal amounts, and in the majority, greater than normal. In only 6 or 8 per cent was the acidity below normal.

Walters, Gray, Priestley and Counseller[11] reporting on surgery of the stomach and duodenum at the Mayo Clinic for 1942 are of the opinion that in the future operative procedures for duodenal ulcer will be about equally divided between gastric resection and gastroenterostomy, with a few miscellaneous procedures done each year.

Finsterer's report in 1918[12] advocating gastric resection with exclusion of the pylorus marked the beginning of radical surgery for chronic duodenal ulcer. Lewisohn[13] at Mt. Sinai Hospital was the first in this country to advocate subtotal resection as an operation of choice in chronic duodenal ulcer, and most of us are familiar with the criticism directed at their work for at least a decade.

While the end-results of gastroenterostomy for duodenal ulcer unquestionably have been satisfactory in a certain percentage of cases, the percentage of good results is very small in cases of true penetrating duodenal ulcers where the floor of the ulcer is formed by an adjacent viscus. Rarely have satisfactory end results been observed in the Stomach Clinic of the Fourth Division at Bellevue Hospital in this type of case.[14,15] We concluded some 14 years ago that patients who can be helped by a gas-

troenterostomy can usually be helped by a prolonged medical regimen.

Subtotal gastrectomy has been accepted as the operative procedure of choice in chronic duodenal ulcer in a number of the clinics, particularly during the past 10 years. One should not be misled by the term subtotal gastrectomy as there is considerable difference of opinion as to what this constitutes: first, the percentage of stomach removed; second, whether the entire antral mucosa has been removed; and third, whether the duodenal ulcer is removed *in toto* or left *in situ*. In the two clinics with which I am associated, we feel that those patients who do not have the duodenal lesion removed have more complaints than those in whom it is removed. There is accumulating evidence to the effect that leaving the pylorus or antral mucosa definitely increases the incidence of gastrojejunal ulcer. [16, 17, 18]

McKittrick, Moore and Warren,[19] reporting on a two-stage operation for chronic duodenal ulcer in a patient 76 years of age, found that the patient did so well following the first stage operation that his attending physician was hesitant to have the second operation performed. After three months, however, signs and symptoms of a jejunal ulcer developed and seven months later the patient returned for a second stage operation. The roentgenograms showed a large jejunal ulcer. The routine second stage operation was carried out and the region of the previous anastomosis was not entered. The pain disappeared and 11 days postoperatively the roentgenologic examination showed a marked decrease in the size of the ulcer. Eight months later the patient was perfectly well. Friedell, Shaar and Walters[16] of the Mayo Clinic have had similar experiences. Jordan[18] of the Lahey Clinic reports an even more dramatic case of recurring jejunal ulcers with repeated massive hemorrhages. In this patient the pylorus was removed 12 years after the original operation with disappearance of the gastrojejunal ulcer and cessation of the massive hemorrhages.

The antral mucosa is the source of gastrin or internal secretion as described by Edkins in 1906,[20] and, unless the antral mucosa is completely removed, we have in effect an organ of internal secretion constantly supplying gastrin to the blood which stimulates the acid cells of the fundus of the stomach. The surgeon would hardly be justified, therefore, in leaving the antral mucosa if he hopes to obtain the most satisfactory end-results in chronic duodenal ulcer.

The advisability of leaving the ulcer *in situ* or of removing it *in toto*

is still a controversial question. In 1945 Rienhoff,[21] reporting on 260 chronic duodenal ulcers, advocated leaving the ulcer and doing a minimum resection. In this group of patients only 107, or 40 per cent, had no free acid after the operation. Twenty-three, or 9 per cent, developed jejunal or marginal ulcers. Colp, Klingenstein, Mage and Druckerman[22] state they do not feel that excision of the ulcer is an essential part of the procedure, provided the pylorus is removed. Mage[23] in a follow-up study of patients on whom subtotal gastrectomy had previously been performed concludes that recurrent gastrojejunal ulcer was no more frequent in those patients in whom the duodenal ulcer was left *in situ* than in those in whom it was excised. Colp et al[22] in their series of 223 chronic duodenal ulcers, performed a subtotal gastrectomy in 77.6 per cent; a posterior gastroenterostomy in 21.5 per cent and a pyloroplasty in 0.9 per cent.

Two questions that constantly arise in a discussion of operative procedures are, first, the end-results, and second, the mortality rate. In this presentation I propose to review the operations I have performed during the past ten years for chronic duodenal ulcer, and determine the end-results and the mortality rate, with emphasis on the incidence of gastrojejunal ulcer.

During a ten year period from 1935 to 1944 inclusive I have had occasion to operate upon 162 patients, either service or private, for chronic duodenal ulcer. The cases I am reporting are primary operations; all secondary operations are excluded. Likewise, the patients operated upon as a life-saving measure during an active massive hemorrhage are excluded. Of these 162 patients, 92 per cent were males and 8 per cent, females. The average age was thirty-eight and symptoms had been present for 7.5 years. The one indication for operation was chronic intractable pain. In 17 per cent of the patients there had been one or more massive hemorrhages accompanied by severe pain. In 10 per cent of the cases there was an associated pyloric obstruction with gastric retention. There was evidence of perforation of the ulcer into the head of the pancreas or the duodenohepatic ligament in 135 or 83 per cent. Seventeen or 10 per cent were multiple duodenal ulcers.

For the past twelve years I have followed the same technique in all operations, namely, between 65 and 70 per cent of the stomach is removed and the duodenal ulcer is always removed *in toto*. In my opinion the ulcer can always be removed, but it requires care to obtain

a line of cleavage between the duodenum and the adherent pancreas. The question is raised by some roentgenologists as to whether the ulcer has been removed if the pathologist does not report it in the specimen. The answer is that in the patient with a long history of ulcer with severe pain, no ulcer as such is present but there is a penetration through the entire duodenal wall from 1-3 cm. and the pancreas forms the floor of the ulcer. When the duodenum has been freed from the pancreas there is no ulcer to present unless a portion of the pancreas is excised, and this is, of course, never indicated. The freeing of the duodenum from the pancreas and the closure of the duodenal stump are the most important steps in a subtotal resection. If the ulcer is left *in situ* the end results are not as satisfactory as when it is removed *in toto*. The mortality in most cases is due to leakage from an insecurely closed duodenal stump. The stump is always sutured with five rows of cotton sutures, the fifth row burying the stump in the head of the pancreas.

The continuity between the jejunum and the stomach is accomplished by an antecolic short-loop anastomosis, utilizing the entire end of the stomach to approximate to the jejunum and starting the jejunal anastomosis at the greater curvature of the stomach 3½ to 5 inches below the ligament of Treitz. Enteroenterostomies are never performed in an antecolic anastomosis even if the procedure is a total gastrectomy for carcinoma. Fine catgut is used for the jejunum-to-stomach anastomosis. Fine cotton was used for two years but was discontinued over two years ago when a gastrojejunal ulcer was met in a primary resection.

In the 162 primary resections there have been six deaths, or a mortality of 3.7 per cent. Of the 156 surviving patients we have a follow-up on 135, or 86 per cent. These cases are now from one to 10 years postoperative, averaging 3.8 years. Among these surviving patients there is one gastrojejunal ulcer, a case in which cotton was used in the anastomosis. This patient has been reoperated upon and is now well three years after the second operation. Two other patients are suspected of having gastrojejunal ulcers. One is a woman who has had recurring hemorrhages, and the other is a man who is having severe pain. There are 10 other patients with minor complaints, but in none of these is there any suspicion of a gastrojejunal ulcer and the x-rays are negative for an ulcer. However, in these cases the end results can not be considered satisfactory. We have, then, a total of 122 cases, or 90 per cent, in which the end results are excellent. It must be remembered that these

patients, although symptomless, may not regain their pre-operative weight for months or years. This constitutes a definite nutrition problem, perhaps associated with a disturbance in pepsin, lipase, and rennin secretion.

In the group of patients followed, gastric analysis has been done on fifty-two patients. The histamine technique of Bloomfield and Polland[24] was used. The stomach contents were aspirated after the patient had fasted for twelve hours and then 0.1 mg. of histamine for each 10 Kg. of body weight was given subcutaneously. Continuous aspiration was employed for forty-five minutes. On the volume withdrawn at 15, 30 and 45 minutes, free hydrochloric acid was determined. It was found that thirty patients or 57 per cent had no free hydrochloric acid either on a fasting stomach or after histamine stimulation. Twenty patients or 38 per cent showed no free hydrochloric acid on a fasting stomach, but after histamine stimulation they had from 2 to 28 units of hydrochloric acid, which is low when compared with 60-120 units in a normal stomach stimulated with histamine. Two patients or 4 per cent had 4 units of acid on a fasting stomach and in one this amount rose to 59 units after histamine and in the other, to 28 units. These studies were done on patients from nine months to ten years postoperative, averaging 2.4 years.

The end-results in this series of cases seem to justify the removal of the ulcer *in toto*. The mortality rate compares favorably with most reports and the end-results seem satisfactory for such a serious disease. As the gastric physiology is rather complex, as illustrated by Wolf and Wolff,[7] it would seem wise for the surgeon to attack the problem of chronic duodenal ulcer as most other abdominal problems are attacked, namely, on a pathologic basis and not on the physiologic basis. We have only to review the literature of the past two or three decades to find innumerable advocates of cholecystostomy as against cholecystectomy in chronic gall bladder disease. Some of the same arguments were used then as now in regard to the adherent duodenal ulcer. Most inflammatory processes are cured by surgery, not by altered physiology.

Conclusions

1. This paper may be criticised because 14 per cent of the patients do not have adequate follow-up.

2. The end-results in the cases followed seem to justify the insistence on removal of the adherent ulcer *in toto*.

3. It would seem appropriate to emphasize pathologic principles

rather than physiologic principles in the surgical treatment of chronic duodenal ulcer.

4. Chronic inflammatory processes, when surgically treated, require removal and the adherent duodenal ulcer is not an exception.

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THE STIMULUS OF WAR TO CARDIOLOGY*

A Review

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IN modern warfare, infectious diseases and injuries requiring surgical care are the chief concerns of the medical departments of the Armed Forces. Cardiovascular disorders among those on active duty have occupied a position of lesser importance, largely because Selective Service and pre-induction examinations have eliminated those recruits manifestly unfit because of such defects. Yet much information has been gained concerning the incidence and types of heart diseases among the population as a whole; and studies in special fields have yielded knowledge not restricted to the conditions of war. In this brief summary are reviewed only a few of the numerous investigations which have been made. Indeed, the results of many of them have not yet been published. The remarks which follow will be confined to a consideration of some of the clinical problems relating to cardiac disease in the Army, which present features of equal interest in civilian practice.

HISTORICAL NOTE

It is doubtful whether it would be profitable to follow the heart of the soldier through all the campaigns of history; it is certainly not practicable because the necessary data are lacking. But some of the observations recorded during the past hundred years serve to reflect the changing points of view during this period. R. H. Hunter,[1] stationed in India, writes in 1836: "Ever since I joined the 2d or Queen's Royal Regiment in Colaba in 1831, I have been struck with the frequency of cardiac and aortic disease.... Whether, or not, rheumatism be the first link in the morbid chain, a more efficient cause for hastening its progress,

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I am convinced, is the active duty a soldier undergoes whilst buttoned up in his accoutrements. These, by compressing the neck and chest, obstruct the circulation to such a degree, as to excite the heart to inordinate action, and consequent hypertrophy in the strong and muscular, or to dilatation in the weak and sickly....

"It seems extraordinary that, now the effects of tight lacing on females are so well known, a soldier, intended for the most active and long continued exertion, should be placed in a similar predicament, when that very exertion is required. Is it possible he could be placed under more unfavorable circumstances?"

The role of tight clothing and heavy equipment as a cause of heart disease continued to occupy the attention of those in authority. In 1870, some thirty-four years later, Myers,[2] an assistant surgeon of the Coldstream Guards, won the Alexander Memorial Fund Prize for his essay, "On the Etiology and Prevalence of Diseases of the Heart Among Soldiers." The Executive Committee of the Fund, composed of distinguished physicians and high-ranking officers of the British Army, chose both the topic and the winner. The subject evidently was considered an important one.

Among Myers' conclusions were these: disease of the heart was more prevalent in the army than in the civil population; its three main causes were rheumatism, Bright's disease, and violent manual labor; syphilis, by attacking both classes to nearly the same extent, produced a relatively equal deteriorating effect; disease of the mitral was more common than disease of the aortic valve in the civil population, and aortic more than mitral in the army. In view of this higher incidence of aortic disease among the troops, the modern reader will wonder whether syphilis, after all, may not have exerted its "deteriorating effect" more frequently in the military man.

With regard to etiology, this author remarks: "there is one special cause of heart disease in our army now clearly laid down by those who have most studied the subject—viz., the prejudicial constriction of the uniform and accoutrements—this producing such obstruction to the circulation that, either directly or indirectly, as by aneurism and disease of the aortic coats, etc., the heart is abnormally strained, and frequently passes into a state of functional derangement, and ultimately of organic disease." Remedial measures were suggested and the opinion expressed that when these had been adopted, heart disease would gradually

diminish in the army.

In our own Civil War[3] organic disease of the heart was rare, only 3,778 cases having been taken to sick report on this account among the white troops during more than five years. But if discharges are taken into account, 10,636 men were lost to the service because of heart diseases. The difference between the two figures, says the official report, may be regarded as expressing the results of acute rheumatism, of which 145,551 cases were registered. This is a surprisingly large number.

The occurrence of idiopathic pericarditis was specifically mentioned and there were numerous instances of sudden death, attributed to "a relaxed or degenerated heart or to the development of fibrinous concretions within its cavities:" One instance of cardiac rupture, referred to as "phenomenal," occurred in a wounded man while confined to bed. Autopsy showed an adherent pericardium; there was no mention of the state of the coronary arteries or of the heart muscle.

The most important and enduring medical contribution to come out of the War of the Rebellion was the paper of Da Costa, "On the Irritable Heart: A Clinical Study of a Form of Functional Cardiac Disorder and Its Consequences," published in 1871.[4] Very little has been added to his description of the essential features of this condition, to which the terms effort syndrome and neurocirculatory asthenia later were applied. To this day, the basic mechanisms responsible for its manifestations are not clearly understood and furnish a subject for controversy.

World War I

Once again functional disorder of the heart, now labeled "effort syndrome," was the condition subjected to most intensive study. It was a cause of much invalidism and a frequent reason for discharge in both the British and American armies. Sir Thomas Lewis and his group at Colchester[5] made the most detailed observations. Lewis was aware that he was describing a series of symptoms which might occur under varying circumstances—as a result of exposure and strain, during delayed convalescence and in association with active infection, particularly tuberculosis. One of his largest groups was that of constitutional weakness, nervous or physical, or both. His critical analysis served to define and stress the various clinical features. He was of the opinion that many could be cured by a system of graduated exercises, and that, in a large number, the natural course was towards recovery. Grant's follow-up

study of 665 of Lewis's cases[6] showed that, in them, the frequency of pulmonary tuberculosis was 80 per cent greater than in the general population of London over the same five-year period. This high incidence was due, undoubtedly, to errors in diagnosis because routine x-rays of the chest were not made. Incipient cardiac disease was shown to be the underlying cause in only a negligible proportion of the patients.

The after histories of a thousand men discharged from the British Army because of valvular heart disease were also studied by Grant.[7] The patients were followed for ten years. Most of them had rheumatic valvular defects; a few had syphilitic aortic disease. Those with a good prognosis showed little or no cardiac enlargement and a good exercise tolerance. Those with a poor prognosis showed moderate or great enlargement and evidences of congestive failure. The onset of auricular fibrillation influenced the general prognosis unfavorably. Grant's final conclusion was to the effect that the outlook of valve defect was not as bad as generally thought, even for syphilitic aortic regurgitation.

Some figures of interest, in relation to those of World War II, are given in the official report of the Cardiovascular Section of the Office of the Surgeon General of the United States Army.[8] In one million recruits, 1.5 per cent were rejected for cardiovascular reasons; 0.88 per cent with cardiac disorders were accepted for limited service only. The causes of disqualification of 11,562 recruits so rejected were: chronic valvular disease, 49 per cent; other organic diseases, 19 per cent; functional disorders, 23 per cent. The belief was expressed that the number rejected for organic heart disease—68 per cent—was too large, due to the tendency on the part of the examiners to classify functional conditions, such as irritable hearts, as instances of organic disease.

In the German[9] and British[10] official medical reports of the first World War there were no features worthy of special mention with respect to the cardiovascular system. Most of the chapter in the British report was devoted to a consideration of the effort syndrome.

World War II

Neurocirculatory Asthenia. Because of the frequency, in the previous war, of the effort syndrome, or as it was now called, neurocirculatory asthenia, the importance of this condition was stressed as soon as the draft became effective. This was done in order to keep out of the

Armed Forces recruits suffering from the disorder and with the idea of learning more of its etiology. At first, cases of slight degree were accepted for service; later it became apparent that it was wise to reject even those with the mildest symptoms, for they made poor soldiers. The diagnosis, however, was not always easy. Fortunately, many of these cases were excluded as a result of the neuropsychiatric examination.

In England, Wood[11] began work in 1940 and in May 1941 read three Goulstonian lectures on "Da Costa's Syndrome (or Effort Syndrome)." His conclusions were based on a careful clinical study of two hundred cases. It was his opinion that the central stimulus was emotional and was commonly the result of fear; that this disorder should be classed as psychiatric; and that the somatic manifestations were of secondary importance.

In this country, White, Cobb and their associates[12, 13] made extensive observations on cases of neurocirculatory asthenia at the Massachusetts General Hospital, in collaboration with the Harvard Fatigue Laboratory. For the purpose of investigation, they regarded as of practical importance the separation of the acute from the chronic type and confined their studies to instances of the latter variety. Only preliminary reports have been published to date, but a number of facts were established. Men with this disorder were not able to do hard work as well as healthy soldiers. Their pulse rate recovery after exercise was slower and the rise in pulse was higher. Lactic acid determinations, taken after a walk of ten minutes on a treadmill, showed a level almost twice as high in patients as in normals. The ventilation index, which is an objective measurement correlated with the subjective feeling of dyspnea, was higher in patients than in the controls. The group with neurocirculatory asthenia showed looped capillary forms in the nail folds whereas in normal persons the hair-pin type predominated. Psychological tests yielded lower scores in those with neurocirculatory asthenia. Attempts to train a selected group under the supervision of an athletic director were unsuccessful. It was concluded, tentatively, that the chronic form of neurocirculatory asthenia is not a simple disturbance of the circulation but is associated with measurable psychological symptoms, abnormal behavior and difficulty in adjusting to life situations. There was evidence, also, of a familial incidence.

Still another approach was made by Starr,[14] using the ballistocardiogram as an indicator. This is a record of the forces generated by

the recoil of the heart and the impacts of the blood. From it can be calculated the cardiac output. The result is not highly accurate, but there appears to be a fairly definite range of normal. It was found that most of the subjects with neurocirculatory asthenia had abnormally large impacts. Starr was not inclined to agree with the notion that the condition is a neurosis, although admitting the possible accessory role of psychic disturbances. He drew the analogy between neurocirculatory asthenia and the common clumsiness of a muscular movement which might date from early life and was perhaps hereditary. Neurocirculatory asthenia, he suggested, might be thought of as a clumsiness of the circulation, with inability to adapt it to the needs of the moment.

Coronary Heart Disease. Fatal coronary arteriosclerosis in soldiers, 20 to 36 years of age, was the subject of a study by French and Dock.[15] Eighty cases examined at autopsy furnished the basis for their conclusions. The disease occurred in men of various racial stocks, without predilection for any particular one. The most common predisposing factor appeared to be overweight, which was present in 91 per cent of the patients. Vigorous effort and the activity of early morning chores brought on the attacks in over 50 per cent. Cardiac hypertrophy of significant degree did not occur in this series. Myocardial scars, indicating previous insults, were observed in 59 per cent of the cases and recent myocardial infarction was found in 19 per cent.

The direct relationship of effort to attacks of acute myocardial infarction in soldiers was further stressed by Blumgart,[16] who reported eleven cases. The matter is of practical importance as well as of theoretical interest. It appears to be true that the majority of attacks of coronary occlusion occur at rest; but this does not preclude the possibility that, in certain instances, exertion may be the initiating factor. There is good evidence, in civilian experience, that this is so.

Quinidine. Before the war, most of the quinidine used in this country came from Java. The supply was abruptly cut off when the Japanese took over the island and the available stock has steadily dwindled. Cinchona bark, obtained from South America, yields comparatively little quinidine. Since this drug is useful in a number of cardiac disorders and may be lifesaving in the treatment of ventricular tachycardia, it became necessary to seek a substitute. Under the auspices of the Subcommittee on Cardiovascular Diseases of the National Research Council, comparative tests are now being made, in patients, of the therapeutic

efficacy of commercial quinidine, synthetic quinidine and dihydroquinidine. Preliminary observations indicate that all three, in proper doses, produce similar clinical effects. The final results are not yet available, but should prove of practical value in the future.

Selective Service Examinations. The numerical importance of diseases of the heart and circulation, in men of draft age, became clearly evident in the figures published in 1942 by the Selective Service System.[17] Following the examination of the first million registrants, 18 to 37 years of age, it was estimated that 10.6 per cent were unqualified for general military service for cardiovascular reasons. Only defects of the teeth and eyes were responsible for a larger number of rejections. In 1944, after examination of 4,049,000 registrants of similar age groups, 58 per cent were disqualified for physical defects.[18] Of these, 6.5 per cent were rejected because of cardiovascular diseases.

Reexamination of Cardiac Rejectees. Because these rates seemed excessive for the age period covered, it was suggested by the Subcommittee on Cardiovascular Diseases of the National Research Council that one thousand men rejected for cardiovascular reasons be reexamined in each of five cities by boards of cardiologists. The plan was promptly approved by Major General Lewis B. Hershey, Director of the Selective Service System. Boston, Chicago, New York, Philadelphia and San Francisco were designated as the places in which the pilot tests should be made, because they could be carried out in large general hospitals with adequate facilities. The objects of the study were first, to obtain a more detailed analysis of problems of cardiovascular diagnosis and to define more clearly the range of the normal heart; second, to determine the possible amount of salvage of men for military service; and third, to compare the opinions of cardiovascular experts with those of examiners in the local boards and induction stations. In addition to the usual history and physical examination, an electrocardiogram and 2-meter film of the heart were taken in every case considered suitable for reclassification as 1A. The final analysis was based on the reexamination of 4,994 men.[19]

The following is a brief summary of the results:

1. Of the total number, 17 per cent were resubmitted as suitable for Class 1A; 83 per cent were confirmed as belonging to Class 4F.

2. The chief cause for final rejection was rheumatic heart disease, which was found in 60 per cent of the final 4F group. Mitral disease was

more common than that of the aortic valve. Auricular fibrillation, complicating mitral stenosis, was observed in only 24 cases.

3. The second most common cause for rejection was hypertension, which was found in 26 per cent. The majority showed elevation of both systolic and diastolic levels. The incidence was higher in the fourth than in the third decade.

4. Responsible for the rejection of between 4 and 5 per cent were, in order, neurocirculatory asthenia, sinus tachycardia and congenital heart disease. In the congenital group, the most frequent diagnosis was ventricular septal defect, which was present in more than a third of the cases. Next came patent ductus arteriosus, pulmonary stenosis (two with the tetralogy of Fallot), coarctation of the aorta, auricular septal defect and subaortic stenosis.

5. Other less common causes for rejection included cardiac enlargement alone, as determined by x-ray examination; and arrhythmia, including paroxysmal tachycardia, uncomplicated auricular fibrillation, auricular flutter and auriculoventricular block. Electrocardiographic abnormalities alone were found in 32 cases, including 10 with bundle branch block. Cardiovascular syphilis was rare, having been found in 17 cases. The diagnosis of coronary heart disease was made in only 6 cases.

6. A history of rheumatic fever was found in a little over one-fourth of all the cases of rheumatic heart disease. This figure was based on data obtained in four of the cities. However, a positive history was noted in nearly half of those in Boston and New York. A history of chorea was rare, having been obtained in only 2 per cent of the rheumatic cardiac cases.

7. Nine of the seventeen cases of aortic syphilis were observed in negroes. Hypertension was more common in the black race. Rheumatic heart disease was evenly represented among whites and blacks, but neurocirculatory asthenia was infrequent in the negroes.

As a result of these examinations, it was concluded that their extension for the sake of salvage alone was of doubtful value because of the time required, the few expert examiners available and the relatively small percentage of men reclassified as 1A. But some of the lessons learned proved helpful in later examinations; and the uncertainty concerning the significance of transient hypertension stimulated the series of "Studies of Blood Pressure in Army Officers," to which reference will be made shortly.

A follow-up study of the men reclassified as 1A has been initiated and will be completed with the help of the Veterans' Administration. In these cases there was a difference of opinion between the special boards appointed for the reexamination study and the local boards or induction stations, which had rejected them. The after histories of this group of border-line cases finally accepted for service, should prove instructive.

Effectiveness of Selective Service Examinations. Three reports have been chosen to illustrate this point. The first was from the Medical Processing Unit and the Station Hospital at the San Antonio Aviation Cadet Center.[20] During a number of months, approximately 45,000 men, between 18 and 27 years of age, were examined. Only 100 were found to have rheumatic valvular disease and of this group, 11 knew of the presence of a heart murmur when in civilian life. This is an incidence of approximately 0.2 per cent. The most common lesion was aortic regurgitation; mitral stenosis was second in the order of frequency.

Another report, from the Navy,[21] was based on the experience of a hospital ship in which there were 9,085 admissions and that of a base hospital in which there were 13,000 admissions. On the ship, 55 patients were found to be suffering from valvular heart disease, degenerative heart disease or functional cardiac disorders; this is an incidence of 0.6 per cent. In the base hospital, 88 patients were found to be suffering from cardiac disorders—an incidence of 0.67 per cent. Sprague and McGinn, who made this study, were impressed by the relative infrequency of neurocirculatory asthenia.

The third report was a summary of the Army's experience with discharges of enlisted men for physical reasons.[22] During the 12 months between July, 1943 and June, 1944, 6.5 per cent of discharges were for cardiovascular diseases. This group was fifth on the list, in which neuropsychiatric disorders led by a wide margin. Cardiovascular diseases appeared to be more common among men who had not been overseas. This was not surprising, for rheumatic fever in the camps at home undoubtedly was responsible for many of these cases; and most of those with cardiac lesions were eliminated during the training period, so that they were not sent out of the country.

Studies of Blood Pressure in Army Officers. The range of the normal blood pressure, both systolic and diastolic, is still not clearly defined. Transient hypertension, due to emotion or some other cause not apparent, has been recognized but discounted by the Army. In Mobilization

Regulations 1-9, issued by the War Department in 1942, it is stated that "if the blood pressure appears to be abnormally high, it will be measured after the subject has rested in the recumbent position." A cause for rejection is "a persistent blood pressure at rest above 150 mm. systolic or above 90 diastolic unless, in the opinion of the medical examiner, the increased blood pressure is due to psychic reaction and not secondary to renal or other systemic disease." "Elevation of blood pressure from excitement proved to be temporary," is not a cause for disqualification. Because of the large number of recruits who showed such temporary elevations, it seemed important to determine their significance as soon as possible.

The records of some 23,000 Army officers on file in the Office of the Surgeon General furnished a ready material. These contained the results of annual physical examinations made between January, 1924 and December, 1941; in more than 1,800, additional information was obtained as far back as 1901. Annual examinations were discontinued in 1941, owing to the pressure of work essential to the war.

A contract was recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and Columbia University, and the work of analysis was undertaken by Drs. Levy, Stroud and White of the Subcommittee on Cardiovascular Diseases of the National Research Council, in collaboration with Brigadier General Charles C. Hillman, U. S. Army. Dr. John W. Fertig, Professor of Biostatistics, Columbia University College of Physicians and Surgeons, aided in the analysis and preparation of the material for final presentation. The method of person-years was used in calculating the results.

A total of 22,741 cases proved to be suitable for study.[23] The average length of the observation period was 12 years. Seventy-two per cent were under observation from 5 to 19 years and 38 per cent were observed from 15 to 19 years. In 1,437 cases, or 6 per cent of the total, the observation period was 20 years or over. The specific indexes chosen to demonstrate the influence of transient hypertension on the subsequent state of health and cause of death were: (1) the later development of sustained hypertension; (2) the disability retirement rates with cardiovascular-renal diseases; and (3) the death rates with cardiovascular-renal diseases.[24]

The frequency with which transient hypertension was first noted

increased with age. The curve of increase was smooth, beginning with an incidence of 6 per cent in the age group 25 to 29 and reaching a plateau of 19 per cent at 50 to 54. At all ages, sustained hypertension developed more frequently in those with previous transient hypertension than in those who never showed an elevation of blood pressure. In both groups, the rate increased with advancing years.

The rate for disability retirement with cardiovascular-renal diseases, which is one index of the usefulness of an officer to the Army, was consistently higher in those with previous transient hypertension than in those with normal pressure levels, at all ages from 35 to 60. The death rate was also higher in those with transient hypertension and the figures rose in the older age groups.

In the study just mentioned, the group with transient hypertension was dealt with as a whole and no attempt was made to ascertain possible differences in the prognostic importance of various systolic and diastolic levels. To obtain data on this point seemed the next logical step in the inquiry.[25] It was found that all levels of transient hypertension, both systolic and diastolic, were significant in terms of the later development of sustained hypertension and retirement with cardiovascular-renal diseases. Of particular interest was the observation that slight degrees of elevation were important, even when the systolic level alone was involved. Of the greatest significance, however, was a transient rise in diastolic pressure above 100 mm., especially as an early sign of subsequent sustained hypertension.

No significant differences were apparent between the various degrees of transient hypertension in relation to the death rates with cardiovascular-renal diseases. Thus, a temporary rise in blood pressure does not appear to foretell the rate of progress of vascular disease or the extent or severity of the lesions which eventually cause death.

These data lend support to the view that transient elevations of blood pressure, above the upper range of normal, often represent an early stage of hypertensive vascular disease.

Many of the registrants with transient hypertension also showed transient tachycardia. By transient tachycardia is meant a pulse rate of 100 or over, which is not persistent and not due to paroxysmal tachycardia. Army Regulations provide that a candidate is not acceptable who shows "a persistent heart rate of 100 or over when this is proved to be persistent in the recumbent posture and on observation and reexamina-

tion over a sufficient period of time."

The groups of cardiologists who made the reexaminations of the 5,000 rejectees, were not impressed by the importance of a temporary increase in heart rate. In fact, in the report of the study, the question was raised as to the advisability of extending the upper limit of normal from 100 to 120 beats per minute. Because of the lack of precise information concerning the significance of transient tachycardia in terms of the subsequent history, the same medical records of 22,741 Army officers were analyzed with transient tachycardia as the topic of central interest. The same indexes for prognosis were employed.[26]

As in the case of transient hypertension, the frequency of transient tachycardia increased somewhat with age, up to 45; at this point, a plateau apparently was reached. The frequency, however, was considerably less than that found for transient hypertension. The group with transient tachycardia showed higher rates for later sustained hypertension and for retirement with cardiovascular-renal diseases than did the control group. The rates were similar to those for the group with transient hypertension.

The death rate with cardiovascular-renal diseases in the group with transient tachycardia was not significantly greater than in the controls. This was in contrast to the group with transient hypertension, in which a significant increase was shown. This discrepancy may have been due, in part, to the fact that the number of deaths involved was small.

When both transient tachycardia and transient hypertension were present, the incidence of later sustained hypertension was more than twice as great as when either condition was present alone. The incidence of retirements and deaths with cardiovascular-renal diseases was also higher, but to a less marked degree.

It was concluded that transient tachycardia due to emotional disturbance or some other cause not discernible, like transient hypertension of similar origin, is often a precursor of hypertensive vascular disease. In this respect, the two conditions are of equal importance.

It seems probable that the facts pertaining to transient hypertension and transient tachycardia, which have been derived from an analysis of the records of army officers, apply also to the general male population of comparable physical fitness and similar age groups. Work with this material is still in progress and other aspects of the study will be reported in subsequent papers.

Conclusion

It is apparent, from this sketchy survey, that many of the clinical problems of military cardiology are closely related to those of civilian life. They differ in being of urgent concern to many persons. In a national emergency, those best qualified willingly concentrate their efforts on tasks of immediate importance. Experience is accumulated rapidly, for results must be obtained with speed. It is well to remember that accelerated accomplishment is possible, in great measure, because of training previously acquired, because of foundations laid by work already done, and because necessary techniques are at hand. In the basic sciences, as indicated in the recent report of Vannevar Bush,[27] it is questionable whether such coördinated and hurried research, in the long run, promotes progress. To clinical medicine, on the other hand, a special opportunity is presented. A large and varied human material is available for intensive study. Conditions can be controlled to an unusual degree. To the investigators in each field every facility is afforded. In this opportunity, cardiology has been permitted to share.

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THE RATIONALE OF PORTACAVAL ANASTOMOSIS*

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SOME of the cirrhoses, certain of the hepatosplenopathies and many of the congestive splenomegalies have some common manifestations, usually evidences of long-standing chronic lesions.

Two symptoms that have always been dreaded, by patient and physician alike, are ascites and gastrointestinal hemorrhage. These are omens of serious pathology, usually associated with severe liver damage or portal hypertension or both. The ascites usually recurs after paracentesis, and once hemorrhage has occurred as a result of ruptured esophageal varices recurrent bleeding is common and sooner or later fatal. The dread of these symptoms by physicians is due to the fact that in the past no adequate therapy has been found and any new method that offers hope of dealing with these two symptoms deserves careful trial and evaluation.

The ascites is usually associated with liver damage and abnormal serum protein findings, especially a reversed albumin-globulin ratio. The severe hematemesis is usually from ruptured esophageal varices, the result of a portal hypertension, caused by either an intra- or extrahepatic portal block. In some of the cirrhosis cases less severe bleeding occurs into the gastrointestinal tract, over a period of days or weeks, resulting in a persistent anemia; the loss of blood is due to a persistent oozing from the mucosa of the intestinal tract associated with a prolonged prothrombin time, the result of a severely damaged liver.

In the patients with ruptured esophageal varices due to portal hypertension the portal block may be intrahepatic, in a cirrhotic liver, or extrahepatic with normal liver, and a congestive splenomegaly and distended portal radicals.

* From the Department of Surgery, Columbia-Presbyterian Medical Center, New York.
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It is obvious that any therapy to combat either one of these major symptoms or both must be preceded by a most careful study of the patient, to determine as far as possible the presence of a normal or a damaged liver and the presence of an intra- or an extrahepatic portal block. In such a study certain liver function tests as well as the physical findings, such as abdominal ascites, dilated superficial abdominal veins and cirrhotic facies, the size of the spleen, x-ray studies of the esophagus, are all important in differentiating intra- and extrahepatic lesions.

It is obvious that whether the portal block is intra- or extrahepatic the blood entering the liver by the portal vein is diminished in proportion to the narrowing of the diameter of the portal radicals. Nature provides a variable amount of shunting of portal blood to the systemic venous system by new dilated veins that develop from potential anastomotic veins in the abdominal wall, the retroperitoneal areas around the kidney and diaphragm, and between the veins around the esophagus and the azygos system and the hemorrhoidal plexus and the branches of the internal iliac veins. Any shunted blood has to pass through the systemic veins and lungs and reaches the liver with arterial blood through the hepatic artery.

Undoubtedly a relatively normal liver with extrahepatic portal block can utilize such by-passed blood more readily than a severely damaged cirrhotic liver, especially if some of the portal blood is still reaching the liver through narrowed intrahepatic portal channels. In the cirrhotic group the portal hypertension is usually not as high as in the cases with extrahepatic block, but because of abnormal albumin-globulin ratios ascites is more often present. In the patients with extrahepatic block with hypertension causing esophageal hemorrhage the shunting of the blood from the portal vein to the systemic system is more necessary and better tolerated by the liver, for there is less blood reaching the liver by way of the portal.

For many years attempts at shunting procedures have been tried with a sound rationale, but have proved generally unsuccessful because of the small vessels used in the shunting operations, the suture techniques used and the failure to use the supportive measures now available in the preoperative, the operative and the postoperative periods. These attempts have utilized branches of the mesenteric veins and smaller venous channels such as the ovarian and spermatic veins. The Eck fistula procedure was tried in a number of patients in France and Germany in

1910-1912 but with only one six months survivor. The cause of the prohibitive operative mortality was most frequently a renal shutdown, largely the result of shutting of the vena cava for too long a period during the suture anastomosis of the portal vein to the vena cava.

For many years one of our most discouraging follow-up problems in our Spleen Clinic at the Medical Center has been that of dealing with recurring hemorrhage in patients who had had a splenectomy for congestive splenomegaly or Banti's syndrome. Efforts at suture anastomosis of the smaller portal and systemic veins had been unsuccessful. We had encountered the problem of ascites and hemorrhage repeatedly without any promise of a successful therapy. But following Dr. Blakemore's brilliant results in bridging defects in large arteries and veins by means of direct anastomosis or by vein grafts, using vitallium cuffs to evert ends of the vessels to provide endothelium to endothelium anastomoses, this method offered definite promise in uniting the larger trunks of the portal system to those of the vena cava and ultimately of carrying out an Eck fistula in selected cases.

These portacaval shunt operations are very difficult and are still in the experimental stage and Dr. Blakemore, Dr. Humphreys and I have not done enough of them or followed the cases operated upon long enough to make any positive or dogmatic statements. But certain of our patients have shown some unexpectedly good results and we have been encouraged to attempt more of these procedures in a group that are otherwise doomed. What is most important from now on is to determine more definitely the best procedure for the patient with intra- or extrahepatic block, and to establish better criteria for differentiating the various lesions giving rise to the arresting symptoms of ascites and gastrointestinal bleeding.

Dr. Hanger will discuss the latter problem and Dr. Blakemore will present the technical operative problems and the results thus far observed. This presentation is from the Combined Spleen Clinic in which a team of internists, pathologist and surgeons have been coöperating.

PORTACAVAL ANASTOMOSIS: A REPORT ON FOURTEEN CASES*

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THE operation of portacaval anastomosis for the relief of portal hypertension has been performed in fourteen patients. In four of the cases the site of the portal bed obstruction was extrahepatic. In the ten remaining cases the site of the portal obstruction was intrahepatic due to portal cirrhosis of the liver. There were two operative deaths, both cirrhosis cases; one occurred a few hours after operation and the other four days following operation.

Splenectomy and left nephrectomy with anastomosis of the splenic vein to the stump of the left renal vein has been performed six times, one, employing the Carrel suture technique and in the remaining five cases the non-suture technique was employed, using vitallium tubes. In a case of a nine year old boy with cavernomatous transformation of the portal vein who had previously had a splenectomy, the stump of the splenic vein was isolated and anastomosed to the vena cava, end to side, employing the suture technique. In the remaining seven of the fourteen cases, the portal vein was anastomosed to the vena cava, end to side (Eck fistula) using the non-suture technique with vitallium tubes.

Whereas the follow up results in the four cases of portal hypertension due to extrahepatic portal block have not been ideal, the operation appears to have been distinctly beneficial in three of the four cases. It is true that three of the four cases have had episodes of bleeding since operation, but in general the bleeding episodes have not been as severe or as frequent as before operation. No case has had hematemesis as was the rule before operation. We now have a follow up of one and one-half years on a sixteen year old girl who, for years before operation had had massive hematemesis followed by tarry stools of two weeks duration. During the year prior to operation the attacks occurred at

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approximately six month intervals. Whereas, since the performance of a spleno-renal shunt one and one-half years ago there have been only two bleeding episodes, one of which was so slight as to be considered negligible and in neither was there hematemesis. A follow up letter from the patient dated January 9, 1946, states there has been no bleeding since March 1945 (nearly a year). She states further that her general health is much improved, has more energy and does not tire easily.

An esophagram made one year following operation on this girl, when compared with an x-ray taken before operation, revealed a marked reduction in the size of the esophageal varices. It is reasonable that this evidence of reduced pressure in the portal system so lessens the strain upon the esophageal vessels as to permit the strengthening processes within the vein walls an opportunity to become effective against erosion or sudden rupture.

This patient had an obstructive lesion (cavernomatous transformation) of the portal vein. One cannot in such case of portal vein obstruction expect the splenic vein, when used to effect a portacaval shunt, to reduce the portal pressure to anywhere near a normal figure. It must be remembered that the splenic vein handles normally only approximately 40 per cent of the total volume blood flow of the portal system. As a matter of fact, opening the spleno-renal shunt at operation in this case reduced the pressure in the superior mesenteric vein from 390 mm. of water to 290 mm. of water—a reduction of 100 mm. in portal bed pressure. Although this is far from the normal figure of 100 mm. of water, it is a great stride in the right direction for this girl and, it may mean just sufficient reduction in portal pressure to change her future from the certainty of a lethal bleeding episode.

The amelioration of the viciousness and frequency of bleeding episodes in this girl and others commends the procedure of portacaval shunt to further trial upon a group of otherwise hopeless cases. Cases of extrahepatic portal block, e.g., cavernomatous transformation of the portal vein, are unsuitable for the establishment of Eck fistulae. An attempt to do so, using a vein graft to bridge the distance from the foreshortened portal vein to the vena cava accounted for our one total failure in the group of four cases of portal hypertension due to extrahepatic portal bed block.

Because of the greater size of the portal vein, its anastomosis to the vena cava (Eck fistula) will shunt a far greater volume of blood than

a spleno-renal anastomosis, which, in effect makes the Eck fistula a more efficient shunt for the lowering of portal pressure. For the above reason and the fact that Eck fistula operations seem to be better tolerated than spleno-renal vein anastomoses we now prefer its use in cases of cirrhosis of the liver.

Of the eight cases of cirrhosis of the liver followed postoperatively four had splenectomy, left nephrectomy with anastomosis of the splenic vein to the renal vein stump and four had anastomosis of the portal vein to the vena cava (Eck fistula).

The indications for portacaval shunt are clear cut in cases of portal hypertension when due to extrahepatic portal bed block. Whereas, in cases of cirrhosis of the liver the problem is more complex. No one disputes the physical facts of the blood pressure lowering effect of a portacaval shunt in the presence of portal hypertension but all insist upon a careful evaluation of the factors that establish the necessity of doing such an operation in an individual case of cirrhosis and when to do it.

Recent advances in the medical therapy of portal cirrhosis of the liver have established the fact that a percentage of these cases can be improved both clinically and by laboratory tests for the measure of liver function. The above facts automatically eliminate then all cases of cirrhosis for surgical consideration who have not had a thorough trial on the medical regime except those cases whose lives are threatened by hemorrhage and, even in the latter group, good judgment must be exercised as to the optimum time to operate. Whereas portal hypertension is the basic causal factor of hemorrhage in cirrhosis cases it is important to remember that a high prothrombin time, itself a sign of severe liver damage, may incite and prolong hemorrhage. Such cases are obviously poorer operative risks, but failing an energetic conservative regime, operation does offer a chance for life. Three of our eight cases fell into the above group. All three went through the shunt operation successfully but two of the three cases had a stormy convalescence. It is true that each case has had one bleeding episode over follow up periods of two years three months, one year and one year respectively, but in no instance was there vomiting of blood during these episodes as had occurred invariably before operation. Furthermore the postoperative bleeding episodes were limited to the passage of two or three tarry stools whereas before operation bleeding would persist for several

TABLE I—PROTEINS*

Name	*Age*	*Sex*	*Findings*	*Type of Shunt*	*Preoperative* T.P.	Alb.	Glo.	*Postoperative* T.P.	Alb.	Glo.
1. Duncan	27	M	Cirrhosis Esophageal Varices	Splenorenal	6.6	2.9	3.7	7.1	3.6	3.9
2. Box 777262	46	F	Cirrhosis Esophageal Varices Ascites	Portal vein to Vena cava (Eck Fistula)	7.8 8.1 8.0	4.3 3.9 4.1	3.5 4.2 3.9	5.6 6.6 6.1	3.4 4.1 3.8	2.2 2.5 2.4
3. Pahuci 690444	5	F	Cirrhosis Esophageal Varices Ascites	Splenorenal	8.2	4.5	3.7	7.4 7.2 7.2 7.3	3.5 3.7 4.1 3.8	3.9 3.5 3.1 3.5
4. Scheingarten 557450	28	M	Cirrhosis Esophageal Varices Ascites	Portal vein to Vena cava (Eck Fistula)	8.5	3.3	5.2	6.9 7.1 7.9 8.8 6.2 7.4	2.6 2.4 2.2 (1.5) 2.2	4.3 4.7 5.7 6.3 4.7 5.1
5. Cocozela 754188	42	M	Cirrhosis Esophageal Varices Ascites	Splenorenal	7.5	3.5	4	6.2 6.8 6.5	2.5 2.6 2.6	3.7 4.2 3.9
6. Mooney 536889	56	M	Cirrhosis Esophageal Varices Ascites	Splenorenal	5.7 7.1 6.4	3.2 3.8 3.5	2.5 3.3 2.9	6.4 7.2 5.8 6.5	3.7 4.1 3.1 3.6	2.7 3.1 2.7 2.8
7. Long 783972	49	M	Cirrhosis Esophageal Varices Ascites	Portal vein to Vena cava	5.3	2.3	3.0	5.9 5.4 5.7	3.6 2.6 3.1	2.3 2.8 2.6
8. Iacoletti 784905	58	M	Cirrhosis Esophageal Varices Ascites	Portal vein to Vena cava	5.2	2.9	2.3	4.5 4.9 4.7 5.0 5.0 5.0 6.2 5.0	2.5 2.3 2.9 1.9 2.0 2.2 3.0 2.4	2.0 2.4 2.0 3.1 3.0 2.8 3.2 2.6

* Proteins expressed in %.

weeks. In fact in two of the three cases at the time of operation the patients had been bleeding for one month each and, in spite of transfusions, the hemoglobin wavered in the twenties in one and the low forties in the other.

Spleno-renal anastomoses using 6 and 8 mm. tubes respectively were done in two of the three cases. In the third case a vein graft using the superficial femoral vein was used to join the portal vein to the vena cava. The objectionable use of a vein graft was necessary in this case on account of tissue edema. Because of the small size of the superficial femoral vein in comparison with the portal vein we feel that this particular shunt was capable of handling no more blood than the spleno-renal anastomoses performed in the other two cases. This was further borne out by the fact that the portal vein pressure fell to only 390 mm. of water upon opening the anastomosis. We now know that all three of these cases should have had a shunt operation comparable to the full size of the portal vein—namely a direct end to side anastomosis of the portal vein to the vena cava. It is of interest that in a year's follow up on a fourth case of cirrhosis who preoperatively had bled less severely, there have been no postoperative bleeding episodes. In this case the portal vein was anastomosed end to side with the vena cava using a 12 mm. vitallium tube. Furthermore x-rays of the esophageal varices done before and six months after operation revealed a marked reduction in the size of the varices postoperatively.

Ascites: Excessive peritoneal fluid was found at operation in seven of the eight cases of cirrhosis followed postoperatively. There was no reaccumulation of fluid in three cases after operation. Two cases required paracentesis once and twice respectively. Whereas, in the remaining two cases paracenteses were performed over increasing intervals for a period of two months in one and perhaps five more months in the other.

A study of portal pressure readings taken at operation before and after opening the shunt when correlated with pre- and postoperative protein values, as these factors relate to the formation of ascites, would be highly informative. Unfortunately, often due to the exigencies of the operation, our portal pressure readings are far from complete. The protein values before and after operation in the eight cases of cirrhosis were as shown in Table I.

A summary of the protein values before and after the formation of portacaval shunts in eight cases of cirrhosis of the liver is as follows: In one case, having esophageal varices but no ascites, there was a significant rise in total proteins and albumin following operation. In two other cases there was a slight rise in total proteins and albumin follow-

TABLE II—BROMSULPHALEIN TEST
Percentage of Dye Excreted After 30 Minutes

Name	*Preoperative*	*Postoperative*
Pahuci 690444	10%	5% 10% 8%
Duncan 767177	70%	38%
Cocozelo 754188	60% (S.B. 1.5 mg. %)	65% (S.B. 2.5 mg. %)
Box 777262	45%	10% 30% 20%
Scheingarten 557450	42%	40%
Mooney 536889	20% (S.B. 3.5 mg. %)	22% (S.B. 1.0 mg. %) 25% 35% 27%
Iacoletti 784905	35% (S.B. 4 mg. %)	35% (S.B. 3 mg. %) 20% (S.B. 3 mg. %) 27% (S.B. 3 mg. %) 61% No jaundice 55% No jaundice 39%

ing operation whereas in the remaining five cases there was a slight fall.

The role of portal hypertension and low proteins as causal factors in the formation of ascites in cases of portal cirrhosis of the liver has long been known. Therefore the relief of ascites following the establishment of portacaval shunts in the above seven cases of cirrhosis having evidence of severe portal hypertension (esophageal varices) is not unexpected. The relative importance of the portal hypertensive factor in the cause and perpetuation of ascites is well demonstrated however in the five cases whose proteins failed to rise to preoperative levels following the establishment of portacaval shunts for the relief of portal hypertension. Whereas in all of the cases operated upon by us there was evidence of severe portal hypertension such is not the case in all cases of cirrhosis of the liver. There are some cases of cirrhosis with ascites due primarily to lowered proteins, a result of liver damage

in which the portal vein radicals have been relatively little constricted by fibrosis.

Bromsulphalein liver function tests were performed before and after the establishment of portacaval shunts in seven of the eight cases of cirrhosis followed postoperatively (Table II).

A summary of the results of this liver function test is as follows: In four of the seven cases bromsulphalein retention decreased following operation, namely, 2 per cent, 32 per cent, 25 per cent and 2 per cent respectively. Whereas in three of the cases there was a slight rise in bromsulphalein following operation, namely 5 per cent, 7 per cent and 4 per cent respectively.

We realize that the number of cases is too small to make these findings of statistical significance; however, it so happened that in all three cases showing increased retention of bromsulphalein following operation jaundice was present when the tests were made—both before and after operation. All chemists familiar with the bromsulphalein liver function test are in agreement that the presence of an elevated serum bilirubin so complicates the quantitative determination of bromsulphalein in the blood as to vitiate the accuracy of the test. In view of the above facts then, should we discard the three cases in which the accuracy of the bromsulphalein tests was compromised by the presence of an elevated serum bilirubin, the evidence favors improvement in this liver function test following the establishment of portacaval shunts.

Unfortunately we cannot present an array of figures concerning other liver function tests before and after the establishment of portacaval shunts in these eight cases (Table III). The results were at least encouraging in the two cases having hippuric acid excretion tests before and after operation.

The behavior of the cephalin flocculation test is interesting.

The usual decrease in the prothrombin time following the establishment of portacaval shunts is informative to the extent to which the change may be attributable to improvement in liver function.

Two of the eight cases of cirrhosis followed postoperatively have died. One, the five year old child whose postoperative course was complicated by polycystic disease of the kidney and chronic nephritis, finally succumbed to uremia two years and three months following a spleno-renal anastomosis. At autopsy the splenic vein was found to have undergone fibrotic occlusion at the anastomosis site. This occurrence

TABLE III—HIPPURIC ACID LIVER FUNCTION TEST
(Normal Secretion One or More Grams Per Hour)

Name	*Preoperative*	*Postoperative*
Long 783972	0.62 grams 1 hr.	0.82 grams 1 hr
Scheingarten 557450	0.8 grams 1 hr.	1.1 grams 1 hr. 1.5 grams 1 hr. 1.3

CEPHALIN FLOCCULATION TEST

	Preoperative	*Postoperative*
1.	4+	0
2.	3+	2+ .5 1.25+
3.	4+	0
4.	1+ 1+	0 0 0 0 0
5.	3+	2+ 3+ 0 2+ 1.75+
Iacoletti 784905	Negative	4 +

PROTHROMBIN TIME

Those cases with elevated prothrombin times usually have returned to normal.

in our first case was not altogether unexpected because it was noted at the completion of the operation that the splenic vein was sharply angulated over the edge of the vitallium tube. Our attempt to relieve this angulation by stay sutures was not essentially successful. The occurrence of angulation at the spleno-renal junction has been largely avoided in subsequent cases by mobilization of a longer segment of splenic vein. This can usually be done by the painstaking ligation of numerous pan-

creatic branches. Even so in one case tissue edema was so extensive as to necessitate the use of a vein graft to bridge the space between the splenic and renal veins.

Though complete fibrotic occlusion of the anastomosis was noted at autopsy no doctor familiar with this child's preoperative and postoperative course (and there were many) but would attest to her remarkable clinical improvement following operation. Attempts at controlling an episode of bleeding that had recurred almost daily over a period in excess of a month had definitely proven a losing game in this child, until the situation of extremis was reversed following operation. Considering the progressive improvement this child made over the year following operation in comparison with the steady downhill course during the year preceding operation is convincing evidence that the spleno-renal shunt was delivering a good volume of blood over the period. And, it is my opinion that the fibrotic narrowing of the anastomosis progressed at a very slow rate with at no time the sudden intervention of thrombus. Furthermore, there is no evidence of the latter upon careful examination of the specimen.

Infra red photographs to show superficial collateral vessels over the abdomen taken three weeks after and fourteen months after operation would support the above conclusion.

The second to die of the eight cases of cirrhosis followed postoperatively lived for one year following the establishment of a spleno-renal shunt. This forty-two year old man had a very bad cirrhosis—the present illness going back months beginning with loss in weight, strength and appetite; jaundice and ascites supervened. There was reversal of the A/G ratio and a 4 plus cephalin flocculation test. Following operation the man gradually gained strength and was finally able to work part time. The ascites never recurred following discharge from the hospital.

Our last follow up on this patient was some three months before the onset of his last illness. We understand the onset of his last illness was sudden with a fever and some abdominal discomfort; he arrived at another hospital with a temperature of 104° F. His course was rapidly downhill; he became stuporous shortly after admission. His exitus a few days later was punctuated by an episode of hemorrhage. We have just recently received the pathological specimen in this case and have not completed the study of the liver. The spleno-renal anastomosis was

found to be patent in the specimen though, due to the considerably larger renal vein, the walls were somewhat fluted bordering the junction with the splenic vein. However, union between the splenic and renal veins was firm. There was no thickening of the vein walls or other evidence of irritation by the vitallium tube. The intima was everywhere intact. No thrombus was present and within the vitallium tube there was full freedom of space for blood flow.

It is obvious from the specimen that the spleno-renal shunt in this case was capable of handling a considerable volume of blood though, no doubt, not nearly so much as an Eck fistula. It would appear from the high fever this man had upon entering the hospital that he may have had some kind of infection or toxemia. At any rate rapid failure of the liver, as no doubt this man had, can in a matter of a few hours so affect prothrombin as to constitute a tremendous factor in the inciting of hemorrhage in a patient proven to have esophageal varices. It is a matter of interest that our operative notes reveal this man's portal pressure as exceeding 500 mm. of water—the highest by 50 mm. of any case so far recorded by us. These facts would argue for the choice of Eck fistula (portal vein to vena cava) anastomosis in this man though it is unlikely that the difference would have been adequate to meet the onslaught of a rapidly mounting prothrombin time—a terminal event.

Summary: A report of fourteen cases in which portacaval shunts were established was presented. The technique, indications for operation and the type of portacaval shunt to be employed were discussed. The role of the portacaval shunt in ameliorating the severity and frequency of hemorrhage in cases of portal hypertension was illustrated.

The influence of the portacaval shunt on ascites was emphasized.

Blood protein levels before and after the establishment of portacaval shunts in eight cases of cirrhosis of the liver were reported.

Bromsulphalein excretion figures before and after operation were presented. Finally, the effect of the portacaval shunt on hippuric acid excretion, cephalin flocculation and the prothrombin time in cases of cirrhosis was discussed.

Conclusions: The number of cases has been too small and the data accumulated insufficient to draw sweeping conclusions. Of one thing we are sure, however, and that is that unless the operation is carried out with infinite care as to details (and there are many) the chances of the portacaval shunt remaining patent are practically nil.

A REVIEW OF 401 CASES OF EARLY AMBULATION*

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THIS paper is a discussion of 401 cases of early ambulation occurring at Presbyterian Hospital between September 1944 and July 1945. The method of handling these cases postoperatively is described and particular emphasis is placed upon the postoperative complications which occurred. The contraindications to early ambulation are briefly discussed and the series is compared with a similar group of cases, not ambulated, taken from the Surgical Files of 1943.

Method: The general method of handling these cases is as follows:

As soon as the patient has fully recovered from the anesthesia, he is put up in a high gatch and encouraged to move about in bed and to take deep breaths. The next morning an abdominal binder is applied and the patient is allowed to stand beside the bed, remaining up about 15 minutes. That afternoon he is again allowed up and assisted in walking about the bed. The second day he is assisted to the bathroom and thereafter is allowed up and around as desired.

Each case is considered from the point of view of certain contraindications before the order for early ambulation is given. These contraindications fall into several groups. Prolonged preoperative bed rest, cachexia, cardiac insufficiency, recent coronary occlusion, shock, severe anemia, hemorrhage or fear of hemorrhage and the presence or suspected presence of thrombi or emboli make up the first group. Suppurative conditions such as peritonitis, pancreatitis and cholangitis make up the second group. Insecure anastomosis, copious tamponade and difficult hernial repairs in which the tissues available are of poor quality, form a third group. Simple drainage is not a contraindication to early ambulation, nor is the presence of a Miller-Abbott tube. In the final analysis the decision to allow the patient up is left to the surgeon who

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has done the case.

Data: There have been 401 cases of early ambulation at Presbyterian Hospital between September 1944 and July 1945. In this series 77.6 per cent of the cases were closed with silk, 10.2 per cent with gut and 12.2 per cent with cotton or other suture material. No particular type of abdominal incision has been favored. Fifty-eight per cent were walking by the end of the second P.O. day, 75 per cent by the end of the third P.O. day. The remainder were walking by the 5th P.O. day. The average length of stay in the hospital postoperatively was 11.3 days.

The types of cases, the average day up, the average duration of temperature, the average maximum temperature, the average length of stay P.O., and the P.O. complications are given in Table I. Table II gives the occurrence and type of P.O. complications in a similar group of cases, not ambulated (taken from the surgical files of 1943). Table III summarizes the P.O. complications in the two groups.

Detailed review of the complications occurring in the early ambulation group is as follows:

Pulmonary: There were eleven cases of bronchopneumonia, none severe. All eleven cases, however, were not ambulated until the fourth or fifth P.O. day. In every instance the pulmonary pathology and symptomatology disappeared rapidly as the patients were ambulated.

Two cases of atelectasis occurred within the first twenty-four hours after operation. Both were relieved by vigorous coughing and back-thumping. Neither case developed subsequent bronchopneumonia and both were ambulated on the third P.O. day.

Vascular: There were 3 cases of phlebothrombosis. The first occurred in a patient convalescing after a herniorrhaphy. He was ambulated on the fifth P.O. day and on the eighth P.O. day had a fully developed phlebothrombosis in one leg. He was put back to bed and made an uneventful recovery.

The second was in a case of acute appendicitis, ambulatory on the first P.O. day and discharged on the fifth P.O. day. Two days later he returned with bilateral phlebothrombosis and x-ray evidence of a pulmonary infarct. Bilateral vein ligation was performed and the patient subsequently recovered.

The third case developed phlebothrombosis eighteen days after a resection of the large bowel for carcinoma. This patient had been

TABLE I—AMBULATORY GROUP

Types of Cases	*No.*	*Average Day Up*	*Average Length of Stay P.O.*	*Average Duration of Temp. (Days)*	*Average Maximum Temp.*	COMPLICATIONS				
						Broncho-pneumonia	*Atelec-tasis*	*Phlebo-thrombosis*	*Pulmonary Infarct*	*Catheri-zation*
Gall Bladder & Common Duct	68	2.1	13	3.8	101.4	3	0	0	0	4
Appendicectomy	114	1.8	6.6	1.2	100.2	0	0	1	1	1
Herniae:	95									
a. One side	65									
b. Bilateral	18	1.5	9.9	2.3	100.5	0	0	1	0	2
c. Recurrent	4									
d. Epigastric	8									
Partial Gastrectomy	23	3.2	12.9	3.9	101.5	2	2	0	0	0
Thyroidectomy										
a. Toxic	15	2.9	6.4	2.3	100.9	1	0	0	0	0
b. Non-toxic nodular	22	1.8	5.2	2.	100.5					
Radical Neck & Breast	4	3.5	9	1.7	100.7	0	0	0	0	0
Exploratory Celiotomy	15	2.7	13	3.4	101.3	1	0	0	0	0
Volvulus of Sigmoid	2	1.0	10	0	98.6	0	0	0	0	0
Hysterectomy	2	2.5	10	8	102.2	0	0	0	0	0
Pancreatectomy	2	3	25	11	102.6	0	0	0	0	0
Splenectomy	2	1	11	2	101.2	0	0	0	0	0
Carcinoma of Large Bowel	9	3	16	5	102.4	0	0	1	0	0
General	28	3.6	13	2.5	101.2	1	0	0	0	9
Total	401	2.4	11.5	3.5	101.1	11	2	3	1	16

TABLE II

NON-AMBULATORY GROUP

Types of Cases	*No.*	COMPLICATIONS					
		Broncho-pneumonia	*Atelec-tasis*	*Phlebo-thrombosis*	*Pulmonary Infarct*	*Dis-tention*	*Catheri-zation*
Gall Bladder & Common Duct	68	5	1	2	1	2	0
Appendicectomy	114	3	2	2	1	2	1
Herniae	95	6	1	3	1	0	7
Partial Gastrectomy	23	2	2	0	0	0	2
Thyroidectomy	37	1	0	0	0	0	0
Radical Neck and Breast	4	0	0	0	0	0	2
Exploratory Celiotomy	15	0	0	1	0	0	1
Volvulus of Sigmoid	2	0	0	0	0	0	0
Hysterectomy	2	0	0	0	0	0	0
Pancreatectomy	2	0	0	1	1	0	0
Splenectomy	2	0	0	0	0	0	0
Carcinoma of Large Bowel	9	0	0	1	1	1	0
General	28	26	0	1	0	13	2
Total	401	23	6	11	5	18	16

TABLE III

	No.	COMPLICATIONS											
		Broncho-pneumonia		*Atelec-tasis*		*Phlebo-thrombosis*		*Pulmonary Infarct*		*Dis-tention*		*Catheri-zation*	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Ambulation Cases	401	11	2.7%	2	.5%	3	.7%	1	.2%	0	0%	16	4%
Not Ambulated	401	23	5.7%	6	1.5%	11	2.7%	5	1.2%	18	4.4%	16	4%

ambulatory since the fourth P.O. day. He was put back to bed and recovered without having a vein ligation. He did not have a pulmonary infarct.

Urinary: There were sixteen cases that required catheterization up to the third P.O. day. Without exception no catheterization was necessary once the patients were fully ambulated.

Data concerning the late follow-up of these patients is as yet incomplate. A six months' follow-up on one-half of the series only, is available. In this group only two cases have had late complications. One is a recurrence of a right indirect inguinal hernia six months after operation. The other is an incisional hernia, which developed in a subcostal incision used for cholecystectomy.

Non-Ambulatory Group: In the group not ambulated, there were twenty-three cases of bronchopneumonia, six cases of atelectasis, eighteen cases of distention, four of which required decompression with the Miller-Abbott tube. There were eleven cases of phlebothrombosis, five of which developed pulmonary infarcts. One of this group died of a massive pulmonary infarct. There were sixteen cases requiring catheterization for six or more days postoperatively. The average length of stay postoperatively was 16.1 days.

Summary: Among the 401 cases of early ambulation there were thirty-two cases with some postoperative complication whereas there were seventy-four such cases in the group not ambulated. When the Chi Square test is applied to these figures it is apparent that the probabilities of this marked reduction in postoperative complications being due to chance variation are 267.2 to 1.

There were no serious wound healing complications, wound disruptions, severe hemorrhages, cases of ileus or deaths in the early ambulation group. No temperature was prolonged because of early ambulation, and in all cases, the return to normal of the bodily functions was more rapid than in the group not ambulated. The majority of the patients were in favor of early rising and very few complained of more pain when up than when lying in bed. The improvement of morale has been startling.

Because of the rapid turnover of patients a tremendous load has been placed on the already overworked operating room staff. The total number of surgical cases per month is governed solely by operative time available.

CONCLUSIONS:

1. There is a significant reduction in the incidence of postoperative complications among the early ambulation cases. The occurrence of bronchopneumonia has been reduced by one-half, atelectasis by one-third, phlebothrombosis and pulmonary infarct by one-half. There are no cases of serious distention, ileus, or deaths in this group. Urinary complications were minimal.

2. There has been no delay in wound healing because of early ambulation and no apparent increase in the incidence of incisional herniae to date. (Six months' follow-up on one-half the patients.)

3. We believe that the first or second postoperative day is the optimum time to ambulate patients, since most of the complications occur in the early postoperative period.

4. The return to normal of these patients has been markedly accelerated. As a result there is a definite economic saving, financial, and in hospital hours, to patient, doctor and nurse.

COMBINED PENICILLIN AND HEPARIN THERAPY OF SUBACUTE BACTERIAL ENDOCARDITIS*

Progress Report of the First Seven Consecutive Successfully Treated Patients

LEO LOEWE, PHILIP ROSENBLATT, HARRY J. GREENE

THE results following the combined use of penicillin and heparin in the treatment of subacute bacterial endocarditis have been published previously;[1, 2, 3, 4] the response to the conjoint therapy being noted initially in seven consecutive, unselected patients suffering from the disease. The original report[1] stated: "Further observations will be required to determine the permanence of results, but the immediate effects suggest uniformly successful sterilization of the blood and relief of clinical manifestations." We now record the follow-up data (Table 1) of the initial series of seven patients whose progress has justified the earlier evaluation.

COMMENT

Seven consecutive, unselected patients with subacute bacterial endocarditis were treated by the combination of penicillin and heparin. In each instance the outcome seemed signally successful; the blood cultures became sterile and the symptoms of fever and toxemia abated.

The present report is in the nature of a follow-up review after a post-therapy interval that approximates two years. In this interim one of the patients died due to intractable congestive heart failure. An autopsy could not be obtained but the patient had shown no signs of bacterial activity for at least six months prior to death. A second patient is still incapacitated as the result of protracted heart failure. She was hospitalized for this and complicating rheumatic activity. Repeated blood cultures were negative. The rheumatic activity subsided with salicylates and bed rest but she was discharged with residual manifesta-

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COMBINED PENICILLIN-HEPARIN THERAPY OF SUBACUTE BACTERIAL ENDOCARDITIS

Progress Report of First Seven Consecutive Successfully Treated Patients

Patient Number	*Age*	*Infecting Organism*	*Span of Treatment*	*Penicillin Total Oxf. Units*	*Heparin Total Mgs.*	*Months Post-Therapy*	*Follow-Up Notes*
1. I.Z.	7½	Pneumococcus Type 27	6/19 to 7/5/43	867,920	1200	28	9/15/43 Hgb. 90%, R.B.C. 5,200,000, ESR 12 mm./hr. Blood culture sterile on this date and again on 2/24/44 and 5/23/44. Upper respiratory infection, tonsillectomy, adenoidectomy, and measles without recurrence. 6/1/45 Weight 110 lbs., slight exertional dyspnea, otherwise normal activity. Attending school. 10/21/45 No complaints. Engaging in all routine activities including sports without ill effects.
2. S.R.	34	Streptococcus viridans	6/19 to 11/2/43	7,890,000	7100	24	2/14/45 Weight 183 lbs., Hgb. 94%, ESR 2 mm./hr. Has had two virus infections, upper respiratory type, for which sulfonamides were given prophylactically. Left ventricular enlargement of heart by x-ray. ECG shows left axis deviation. 6/3/45 Slight exertional dyspnea. Blood culture sterile. Hgb. 104%, ESR 2 mm./hr. Working eight or more hours a day for nine months as retail hardware salesman. 10/21/45 Condition status quo. Weight 183 lbs., B.P. 142/72, Hgb. 97%, ESR 6 mm./hr. Blood culture sterile.
3. L.O.	24	Streptococcus viridans	7/31 to 10/19/43	7,694,800	6700	—	Moderate congestive heart failure soon after discharge. Exertional dyspnea and dependent edema increased despite therapy. Readmitted to hospital 1/17/44 to 2/12/44. Succumbed to intractable congestive heart failure resulting from inability of myocardium to accommodate for loss of valve substance. No clinical or laboratory signs of bacterial activity for six months prior to death.
4. J.N.	31	Streptococcus viridans	8/26 to 9/8/43	1,400,000	1800	25	4/2/44 Clubbing of fingers receded. No residua from post-therapy cerebral embolism. Hgb. 80%, ESR 5 mm./hr., and blood culture negative. 2/14/45 Weight 176 lbs. No visible change in either size or contour of heart by x-ray as compared with study of August 1943. 6/3/45 No complaints. Hgb. 104%, ESR 3 mm./hr. Blood culture negative. 10/21/45 Occasional colds. No complaints. Weight 189 lbs., B.P. 180/60, Hgb. 97%, ESR 2 mm./hr. Blood culture sterile.
5. C.M.	22	Streptococcus viridans	8/26 to 10/19/43	6,650,000	7600	24	Developed congestive heart failure following excessive exertion. 6/17/44 readmitted to hospital for intensive treatment of myocardial insufficiency and superimposed rheumatic activity. Temperature and fugitive joint pains; auricular fibrillation. Repeated blood cultures sterile. Responded slowly to salicylates and dehydration therapy. Discharged with residual heart failure. 2/14/45 Teleoroentgenogram shows no change in cardiac silhouette since initial discharge from hospital. ECG discloses auricular fibrillation, myocardial damage and right axis deviation. 6/28/45 Felt much better following continuous regime for protracted heart failure. Less dyspnea and fatiguability. Abdomen less distended, some recession of liver enlargement and minimal pretibial edema. 10/21/45 Progressive improvement. Now maintained on urea obviating necessity for mercurial diuretics. Weight 122½ lbs., B.P. 98/64, Hgb. 97%, ESR 28 mm./hr. Blood culture sterile.
6. H.C.	52	Streptococcus haemolyticus	8/28 to 9/10/43	1,400,000	1500	25	11/24/44 Weight 163 lbs., Hgb. 94%, ESR 7 mm./hr. Blood culture sterile. 2/14/45 No complaints, exertional dyspnea or fatiguability. Aortic diastolic murmur softer in character. ECG shows left axis deviation and myocardial damage. No clinical evidence of myocardial embarrassment. 6/3/45 Some fatiguability. Occasional precordial distress. No changes clinically. B.P. 138/80. Blood culture negative. Employed for over a year as secretary. 10/21/45 No complaints. No edema. Weight 156½ lbs., B.P. 138/84, Hgb. 90%, ESR 11 mm./hr. Blood culture sterile.
7. I.S.	35	Streptococcus viridans	9/26 to 10/9/43	3,203,200	6700	24	2/14/45 Progressive improvement. States he feels better than prior to illness. Mitral systolic murmur barely audible. Cardiac x-ray fails to show definite evidence of cardiac enlargement; contour was not disturbed. ECG discloses sinus tachycardia and left axis deviation. 6/3/45 No exertional dyspnea even on climbing three flights of stairs. Weight 192½ lbs. Auscultatory findings unchanged. Hgb. 106%, ESR 11 mm./hr. Blood culture negative. Army rejection only on basis of poor vision. Workng steadily as machine operator (10/21/45).

tions of myocardial embarrassment. There has since been slow but progressive response to treatment.

The remaining five patients have been completely rehabilitated; the youngest, a child of nine, is attending school. Of the four adults, one is working as a retail salesman, another as a waiter in a night club, a third as secretary, and the fourth as a machine operator.

During this post-treatment period, several of the patients have had upper respiratory infections without activation of the endocarditis. Patient No. 1 has successfully survived the measles, a severe tonsillitis, tonsillectomy and adenoidectomy. Patient No. 7 was rejected in his Army physical examination merely on the basis of poor vision. His present work as a machine operator requires that he climb daily three flights of stairs.

Summary

A post-treatment observation period approximating two years relative to the original seven patients treated for subacute bacterial endocarditis by combined penicillin and heparin therapy justifies the conclusion that the immediate effects of successful sterilization of the blood and the relief of clinical manifestations have been maintained. Observation of this initial group will be continued and later reports may further indicate the relative permanence of the successful therapeutic result.

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Postwar Expansion of Senior House Staff Positions in the Mount Sinai Hospital

I. SNAPPER

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The problems of medical education connected with the return of many thousands of Army and Navy Medical Officers to civilian life are manifold. The greater part of these men desire postgraduate training. Many are interested in postgraduate lecture courses; others wish to work for a period of one or more months as postgraduate students in different departments. As far as the capacity of the hospital permits it usually is not difficult to cope with such wishes.

One of the major problems is presented by the desire of hundreds of returning Medical Officers to receive supplementary hospital training as assistant residents and residents. Most of these men have been obliged to join the Armed Forces after 9-month or 12-month periods of internship and it can be readily understood that they feel the necessity to complete their house staff training. In addition, large numbers of Medical Officers had already decided before they went into the Army or Navy to specialize in medicine or surgery. Often they had started their specialized training before the war and now after discharge from the Service they try to obtain residencies in the specialties in which they are interested. Finally, there are many Medical Officers who have already worked as general practitioners for one or more years and who, during their military career, have decided to go in for specialties.

The Trustees of the Mount Sinai Hospital felt it imperative to cope as much as possible with the needs of the returning Medical Officers. This decision required the institution of new assistant residencies and residencies. In order to obtain the necessary expansion of the house staff, several difficulties had to be overcome. In the beginning it even seemed that these plans could not be realized because of limitation of house staff quarters and dining room facilities. However, by the introduction of certain improvisations and reorganizations a considerable increase of both house staff quarters and dining room facilities could be obtained. Thereafter, it was possible to submit the following plans which ultimately were accepted for implementation.

I. All pre-existing Assistant Residencies and Residencies are to be filled by returning Medical Officers as soon as the positions become free. After April 1, 1946, practically all pre-existing Assistant Residencies and Residencies will be occupied by returning Medical Veterans.

2. Creation of new Residencies.

a. *Medicine*

(1) The Mount Sinai Hospital has two Medical Services, each of which had one Resident. As of January 1, 1946, the house staff of each Service will be headed by two Residents.

(2) The Mount Sinai Hospital had under wartime conditions 8 senior interns who served a mixed internship. By April 1, 1946, these mixed senior internships have been abolished. Six of these 8 senior interns will be replaced by Assistant Residents in Medicine who will serve for 8 months in General Medicine, 2 months in Neurology and 2 months in Pediatrics.

(3) The Mount Sinai Hospital always had 2 Medical Resident Physicians in the Semi-Private and Private Pavilions. On January 1, 1946, this number was increased to 6. Each of these 6 men will work for 8 months in the Private Pavilions and for 4 months in the medical wards of the hospital. During the latter period each will act as the third assistant Resident in the Medical Wards, which will bring his training under

the direct supervision of the medical chiefs.

Four Resident physicians are sufficient to handle the work connected with the medical patients in the Semi-Private and Private Pavilions. When 4 Residents are on duty, enough time is available to permit them to attend medical lectures and other educational activities which are going on daily in the Hospital, usually between 4 and 6 P.M. Measures are taken in order to obtain a closer supervision of the work of the Medical Residents in the Private and Semi-Private Pavilions by the Attending Staff members whose patients were admitted.

b. *Pediatrics, Orthopedics, Ophthalmology, Pathology, Neurology and Radiology*

In addition to the normal number of pre-war Residencies, an extra one-year Assistant Residency was created in Pediatrics, in Orthopedics, in Ophthalmology and in Pathology. The Department of Neurology opened two new Assistant Residencies, the Department of Radiology two new Residencies and three positions for Postgraduate students.

c. *Neurosurgery and Urology*

Measures were taken permitting the creation of a new Residency in Neurosurgery and a new Assistant Residency and Residency in Urology which had not existed under pre-war conditions.

d. *Pathology*

The number of Residents in Pathology was increased from 2 to 3. Apart from the regular Residents, the Department of Pathology has always had a considerable number (about 10) of Fellows and Research Assistants. These positions are from now on reserved for returning Medical Officers and within a year these positions will all be held by Veterans who will be trained as Postgraduate students.

e. *Surgery*

Instead of the senior interns who, during wartime rotated through the surgical services, two new positions of junior assistant residents are created. These men will rotate through General Surgery, Urology (6 weeks), Orthopedics (4 weeks), and Gynecology (6 weeks).

The Mount Sinai Hospital had two Assistant Residents and two Residents in the Surgical Wards containing around 120 beds. The Surgical Chiefs were of the opinion that an increase in this number would lead to an undesirable dilution of the operating activities of the Residents. It followed that an increase of the surgical resident training in the Mount Sinai Hospital could only be obtained by a reorganization of the Surgical Assistant Residency and Residency in the Semi-Private and Private Pavilions. On an average, there are 150 surgical patients in the Semi-Private and Private Pavilions of the Hospital. Surgical Residencies in the Private and Semi-Private Pavilions have certain innate deficiencies which can partly be remedied but can never be cured entirely. The main objection against such a Residency consists of the fact that Surgical Residents in the Private Pavilions cannot be allowed to perform independently surgical interventions. The practical work of such Residents can, therefore, at best consist only of assisting expert surgeons at operations.

Notwithstanding this deficiency it has been possible to remodel the Surgical Residencies in the Private Pavilions in such a way that a year of intense and fruitful instruction in surgery resulted. In peacetime, the number of Assistant Residents and Residents in Surgery in the Private Pavilions varied from 6 to 8. It was decided to increase this number to 18 Resident Surgeons, 9 of these are to be appointed every January 1st, the second group of 9 every July 1st. During the first 6 months of their appointment these resident surgeons will work as Assistant Residents, the second half-year as Residents. In order to streamline the work of the Surgical Assistant Residents and Residents, the considerable number of operating surgeons who admit patients to these pavilions was divided into 6 groups.

Three of these groups consist each of an Attending Surgeon of the Mount Sinai Hospital with his Associate. The 4th group consists of the Chief Gynecologist with 3 of his colleagues and Associates.

The 5th group consists of the Attending Urologist with one Associate.

The 6th group designated as "The Pool" is formed by all the other surgeons who operate in the Private and Semi-Private Pa-

TABLE I

POSTWAR INCREASE OF ASSISTANT RESIDENCIES AND RESIDENCIES OF THE MOUNT SINAI HOSPITAL

	Assistant Residents		Residents	
	Peacetime	*Postwar*	*Peacetime*	*Postwar*
Gynecology	1	1	1	1
Medicine (wards)	0	6	2	4
Medicine (private)	..	..	2	6
Neurology	2	5	1	1
Ophthalmology	1	2	1	1
Orthopedics	1	2	1	1
E. N. T.	1	1	1	1
Pathology	..	..	2	3
Pediatrics	2	3	1	1
Radiology	..	..	4	6
Surgery (ward)	2	2	2	2
Surgery (private)	4	9	4	9
Urology	..	1	..	1
Neurosurgery	..	..	..	1
Anesthesiology	..	..	2	2
	14	32	24	40

vilions.

To each of the first 3 groups mentioned above, one Assistant Resident and one Resident are assigned. One Assistant Resident is assigned to the gynecological group, another Assistant Resident to the urological group. To the pool 3 Residents and 3 Assistant Residents are assigned. The Assistant Residents and Residents make daily rounds with the surgeons to whom they are assigned, assist at the operations of these surgeons and take care of the after treatment of the patients.

The one remaining Assistant Resident works as an Assistant Resident in the Department of Urology of the Hospital. The 3 remaining Residents work as Assistant Residents in the Wards because at the same time the regular peacetime Assistant Residencies in the Wards have been abolished.

The schedule divides the year into 6 periods of 2 months each. Each of the assignments mentioned above lasts for 2 months. Each man works one period of 2 months as Assistant Resident in the Wards, works for 2 periods of 2 months each in the Pool. For the remaining 3 periods of 2 months each, he is assigned either as an Assistant Resident or Resident to one of the first 3 groups or as an Assistant Resident to the Gynecologists or the Urologists or as an Assistant Resident to the Urological Wards.

For the returned Army Veterans who work as House Staff Members or Postgraduate students, a teaching program has been organized.

1. Every day between 4 and 6 P.M., Surgical, Orthopedic, Neurosurgical, Urological, Gynecological and other demonstrations and lectures are held. The resident group is assigned to be present at the monthly Surgical Departmental Conference, the Urological Conference, the Gynecological Con-

ference, etc. They also attend the Clinical Pathological Conferences which are held once or twice a week in the Hospital.

2. A special weekly x-ray conference for the Semi-Private and Private Pavilions has been created. Here the Residents present a short clinical resumé of the case history of their patients, whereafter the Radiologist discusses the x-ray films taken of the patients.

3. A special weekly Surgical Pathological Conference for the Semi-Private and Private Pavilions has been organized where the surgical specimens obtained during the week in these pavilions are demonstrated and discussed by the Pathologist.

4. Each surgical Resident and each Assistant Resident has to follow one evening a week for 2 hours a course in Surgical Pathology where, after demonstration of the microscopic specimens by an instructor, the Residents, themselves, study these specimens under the microscopes under supervision.

5. Finally, Columbia University has placed one dissection room and 2 bodies at the disposal of the Mount Sinai Hospital where each Assistant Resident and Resident follows a course in practical dissection under strict supervision by an expert instructor in anatomy 2 evenings per week for 4 months.

In this way the Surgical Residency in the Semi-Private and Private Pavilions has been transformed to a year of careful and intensive training in Surgery. This year Residency offers not only well supervised observation and surgical diagnosis at the bedside with daily assistance at operations, but also basic medical training in Anatomy, Surgical Pathology and X-ray diagnosis. The practical training is rounded up by daily clinical demonstrations and discussions of surgical and allied problems.

It seems fair to weigh the advantages and disadvantages of such a Surgical Residency in the Semi-Private and Private Pavilions as compared with a Residency in the Surgical Wards of the Hospital.

The main disadvantage that a Resident in the Private Pavilions is not in a position to perform independently any kind of major surgery, can never be entirely overcome. In the schedule described this deficiency is at least partly remedied because every Resident in the Private Pavilion works for a period of 2 months as an Assistant Resident in the Surgical Wards of the Hospital. This period always falls in the second part of the assignment when the Private Surgical Resident has already obtained a certain amount of experience. It will thus be possible to assign him during this two-month sojourn in the Wards a certain amount of independent surgery.

Three of each group of 9 men will, in addition to this two-month Assistant Residency in the Surgical Wards, also work for 2 months as an Assistant Resident in the Urological Wards.

The Residency in the Private Pavilions, however, has not *only* disadvantages. As a matter of fact, it has major advantages. In this connection the more intimate participation of the Private Resident in the work of the Surgical Chief may be mentioned. The Attending Surgeons, although well acquainted with the medical and surgical problems of all their ward patients, actually perform only a limited number of operations on ward patients. Part of the technical work in the Surgical wards is assigned to Associate Surgeons and Adjunct Surgeons. The Ward Residents, therefore, receive the major part of their technical training from the younger Surgical Staff members and have only relatively little direct contact with the Chiefs. In the Private Pavilions the Surgical Chiefs perform all the operations upon their patients personally. Since each Attending Surgeon has about 15-20 patients in the Private and Semi-Private Pavilions, the personal teaching of the Assistant Resident and Resident in the Private Pavilions by the Surgical Chief himself is much more intensive than in the Ward.

Another point has also to be considered. In the Hospital Wards the Surgical Chiefs perform only the more complicated interventions. The Ward Resident, therefore, learns the technique of hernia,—appendix,—simple gall bladder,—simple stomach operations—from the younger Attending Surgeons. In the Private Pavilions conditions are different and the Residents in the Private Pavilions are instructed in the tech-

nique of *all* operations—simple and complicated—by the Chiefs themselves.

Finally, the amount of medically useless activities which the Hospital Administration requires of Ward Residents has in the course of years reached colossal dimensions. This results in a considerable amount of loss of time to the Ward Residents. It is wellnigh impossible for the Ward Residents to be present at the educational functions of the Hospital unless these are organized at night. The Ward Residents would not be in a position to follow the courses of instruction outlined above as organized for the Residents in the Private Pavilions.

The Residency in the Private Pavilions, therefore, offers valuable training in clinical and operative surgery and in the basic medical sciences and suits exactly the needs of the returning Medical Officers and forms an excellent preparation for further specialization in Surgery. It is to be foreseen that in the future the Mount Sinai Hospital may well require such a year Residency in the Private Pavilions as a prerequisite for Ward Residencies in Surgery, Urology, Gynecology, and Orthopedics.

In this way the number of assistant residencies has been increased from 14 to 32, of residencies from 26 to 40. In addition to this creation of 32 new positions on the House Staff, the reorganization of the medical and surgical residencies in the Semi-Private and Private Pavilions has transformed the former 2 medical and 8 surgical residencies in these Pavilions into educationally valuable assignments.

The factual increase, therefore, amounts to 42 senior House Staff positions.

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CORRECTION

The Director, Board for the Investigation of Epidemic Diseases, Army Service Forces advises the Editor that the military title, Major M.C., erroneously appeared under the name of C. H. Rammelkamp in the Bulletin, Vol. 21, No. 12, p. 656, 1945.